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ABSTRACT

The use of Carba-linguaduc equipment (an electronic device that facilitates communication in the nonverbal) in the teaching of basic reading skills was compared to gestural yes/no responses in a study with four severely cerebral palsied/moderately retarded young adults (ages 20 to 30). Results indicated that significant language learning was present, and that the Carba-linguaduc equipment was more effective and objective than the gestural yes/no responses for this population. Among appendixes are sight word lists and forms on physical control evaluation and the placement of letters on display boards. (PHR)

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Paper Presentation: TEACHING WORD RECOGNITION TO NON-VERBAL CEREBRAL
PALSID YOUNG ADULTS UTILIZING WORD-FAMILY PATTERNS
AND CARBA-LINGUADUC ELECTRONIC COMMUNICATIONS
EQUIPMENT

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The Problem

The research focused on whether significant language learning as measured by number and percentage of new word families recognized can take place in the severely physically handicapped, moderately retarded, non-verbal cerebral palsied young adult. The effectiveness of Carba-linguaduc Electronic Communications Systems in helping these adults over the use of subjects' gestural yes/no responses in teaching and assessing word recognition abilities and achievements was examined by (1) effectiveness of subjects' responses using Carba to facilitate the teaching and assessment of new words as compared with effectiveness of subjects' gestural yes/no responses and (2) reliability of subjects' responses using Carba as compared with reliability of subjects' gestural yes/no responses.

Population Selection

Four subjects were selected for the study based on the following criteria: (1) demonstration of the ability to appropriately use the Carba equipment, (2) demonstration of a discernible yes/no gestural response, (3) verification from the subject's teacher that s/he could identify the letters of the alphabet using the Carba equipment and/or a yes/no gestural response, (4) demonstration of an attention span approximating sixty minutes while using the Carba equipment and while participating in classroom activities, (5) verification from the subject's teacher that s/he had a sight word vocabulary of at least 30 words, and (6) demonstration of the ability to give an alternative response utilizing a gestural method other than the normal gestural yes/no response or the Carba equipment.

In addition, a subject had to have been severely physically handicapped and nonverbal as a result of cerebral palsy. As indicated by psychological testing results and teacher appraisals, a subject had to have been assessed as being within the moderately retarded range of intelligence. A subject had to be within the chronological age range of twelve years, zero month to twenty-nine years, eleven months to be considered for the study.

Experimental Design

An AB_1AB_2 multitreatment baseline design was used. This design permitted the evaluation of two treatments: use of Carba-linguaduc systems to teach and assess word recognition (B_1) and reliance on gestural yes/no responses from subjects to teach and assess word recognition (B_2). It was necessary for baseline conditions (A) to be assessed so that it could be determined that observed improved definitive response behavior patterns could be attributed to the introduction of a treatment.

Using Sight Word Lists I, Chart 1, baseline conditions were recorded for a period of six consecutive school days. These conditions refer to those behaviors present prior to and at the conclusion of the introduction of either treatment, e.g., the manner and degree of accuracy with which subjects were able to identify words for teaching and assessment purposes without the use of Carba equipment or their primary gestural responses. Consequently, to obtain baseline data, subjects used their secondary yes/no gestural responses. Each subject determined what would constitute his/her secondary gestural yes/no response. Subject A used a visual fixation method for identifying the requested word. Subject B pointed to the word requested using the blunt end of an arts and crafts paint brush that had been positioned between the thumb and index finger of her left hand. Subject C identified the word requested by attempting to place her left hand on the word. Subject D pointed to the word requested with the fingers of her left hand.

Following initial assessment of baseline, the first treatment (B_1), the use of Carba systems to teach and assess word recognition, was introduced using Training List I and Transfer List I. Subsequent return to baseline (A) was achieved, using Sight Word Lists II, Chart 2, followed by the introduction of the second treatment (B_2). Training List II and Transfer List II were used to assess the subjects' primary gestural yes/no responses for teaching and assessing word recognition during the second treatment. Final return to baseline (A), or control condition, was accomplished following the second treatment (B_2) utilizing Sight Word Lists III, Chart 3.

A treatment was introduced so that definitive response behavior demonstrated by subjects during baseline assessment could be improved. Definitive response behavior by subjects was affected by either treatment, but baseline assessment behavior was not. After a treatment had been introduced, completed and discontinued, the same behavior response patterns observed prior to the introduction of a treatment were again observed among the subjects, e.g., definitive response behavior by subjects was greater with the use of a treatment than was the definitive response behavior by subjects without the utilization of a treatment. Because two treatments were introduced under the same conditions, the treatments could be compared and evaluated as to which, if either, was more effective and reliable.

In terms of teaching and assessing, there are specific limitations associated with the primary gestural yes/no responses an individual might use. Such a mode of communication is subjective in that it is dependent upon interpretation by the receiver of the message. Often, a nonverbal

individual who relies on gestural responses for communication uses a variation of a response. Consequently, it becomes necessary for the person who has had the most experience working with the subject who uses the gestural yes/no response to interpret an answer.

In comparison, sophisticated electronic equipment, such as the Carba-linguaduc, is not subject to a particular person's interpretations. Once the severely physically disabled person has learned to manipulate the instruments, definitive replies are possible. Furthermore, the Carba instruments extend the communication possibilities of the severely physically disabled in that they are able to use the machine to respond to more complicated questions or commands than those requiring a simple yes or no reply.

Statistical Design

Descriptive data were obtained for each subject. The total number of responses made during each baseline and treatment sessions were recorded for each subject. Percentages and means were determined for correct responses, incorrect responses, no response, and indeterminate responses.

The difference between the mean correct responses using Carba (treatment B_1) and the mean correct responses using gestural yes/no responses (treatment B_2) was determined for each subject. The Carba equipment was determined to be effective if the difference was greater than the mean correct responses using subject's gestural yes/no responses.

The percentages of indeterminate and no responses were summed and compared with the percentages of correct and incorrect responses each subject made while using Carba (treatment B_1). The same data were obtained on each subject while using a primary gestural yes/no response (treatment B_2). A treatment was determined to be reliable if the sum of the percentages of correct responses and incorrect responses was greater than the sum of the percentages of indeterminate and no responses.

Procedure-Baseline Treatments

The AB_1AB_2A experimental design required that baseline (A) be assessed on three occasions: prior to treatment B_2 , and following treatment B_2 .

Each subject was assessed in a one-to-one situation using his/her word lists. Sight Word Lists I, Chart 1, were used to assess baseline prior to treatment B_1 ; Sight Word Lists II, Chart 2, were used to assess baseline prior to treatment B_2 ; and Sight Word Lists III, Chart 3, were used for assessment following treatment B_2 .

The sight word lists were individually constructed for each subject and consisted of ten words each. Words were selected and verified by the subjects' teachers as being words that were a part of each subject's sight vocabulary. Sight words verified as being a part of each subject's vocabulary were used rather than words unknown by the subjects, so that only the ability to respond effectively and reliably would be considered and the variable of also learning additional words would be eliminated. Words used to assess baseline conditions were transferred from the sight word lists to individual cards measuring 2" x 2" utilizing a felt tip pen. A wooden card stand was used for placement of sight words in groups of three to be presented to each subject. A stopwatch was used to record time variables during baseline assessment.

Baseline assessments were conducted in the subject's regular classroom. The investigator conducted the assessment sessions and was assisted by a paraprofessional. The paraprofessional and investigator served as observers. One member of the observation team, either the

investigator or the paraprofessional, was independent, meaning that he or she had not previously worked with the subject on any educational program. It was not feasible for the paraprofessional to always act as the independent observer because the investigator had taught only three of the four subjects.

In these three instances, the paraprofessional used had not previously worked with the subjects and was the independent observer. However, the investigator had not previously taught one subject. In this particular instance, the investigator was the independent observer. It was necessary for either the paraprofessional or investigator to have had previous working experience with the subjects because of the subjects' severe physical disabilities. The paraprofessional was only aware that the investigator was conducting research and was not told about the nature of the research or the results sought.

The investigator was seated to the left of the subject; the paraprofessional was seated to the subject's right. The subject and observers were seated at a six foot long table. The subject was seated in a wheelchair between the observers. Directly in front of the subject and in view of the observers was a raised wooden card holder to display materials used during the investigation.

Six sessions were held during each of the three baseline assessments periods for a total of eighteen sessions. During each session, ten words obtained from each subject's sight vocabulary were presented. Each word was presented for identification three times. Words were presented in

groups of three. The order of presentation for the words was randomly determined using a random numbers table for each session.

Each subject was requested by the investigator to identify the requested word by whatever means was available to him/her. One subject identified the word by attempting to place her left hand on the word. A second subject used a visual fixation method for identifying the requested word. The third subject pointed to the word requested with the fingers of her left hand. The fourth subject pointed to the word requested using the blunt end of an arts and crafts paint brush that had been positioned between the thumb and index finger of her left hand.

Baseline conditions present prior to the introduction of treatment B_1 were obtained for a period of six consecutive school days. The following data were recorded: (1) whether an attempt was made to respond (2) method each subject used to identify a sight word requested; (3) length of time each subject required to identify a requested sight word; and whether response was deemed correct, incorrect, or indeterminate. A response was deemed correct if the subject responded in such a manner that an independent observer and the investigator agreed that the response was correct. A response was deemed incorrect if the paraprofessional and investigator agreed that the response was incorrect. The response was judged indeterminate if the paraprofessional and investigator were not in agreement as to whether or not a response was correct.

Using baseline data, stable behavior was established prior to the introduction of treatment B_1 . Behavior was considered stable if not more than ten percent variation from the mean correct, incorrect, indeterminate, and no response behaviors were observed for four to six days. After the

introduction of treatment B_1 , baseline data were assessed for the second time. The same procedure as described above was used for the second assessment utilizing Sight Word Lists II, Chart 2. Following the second assessment, treatment B_2 , was introduced. At the conclusion of treatment B_2 , baseline assessment was established for the third and final time utilizing Sight Word Lists III, Chart 3, and the procedure described above.

Procedure-Treatment B_1 Carba-linguaduc

The AB_1AB_2A experimental design required that two treatments be administered to the subjects studied. Each subject was instructed in a one-to-one situation using Training List I and Transfer List I, Chart 4. The subjects' teachers verified that the words used during the treatment sessions had not previously been taught. All instruction was conducted in a mobile laboratory containing the Carba equipment. Two observers participated in the study. The investigator, trained in the operation of Carba, conducted the training sessions and served as one observer. A paraprofessional who worked at the Arbutus Development Center served as the second observer. The investigator was seated to the left of the subject. The paraprofessional was seated to the subject's right. The subject was seated in a wheelchair between the investigator and paraprofessional. Directly in front of the subject was a platform on which was placed the synoptic display board. The synoptic display board was positioned so that it was in direct view of the subject as well as the investigator and paraprofessional.

Four teaching sessions were conducted for each subject. Each teaching session was limited to sixty minutes per subject. In sessions one to four, three words of the same family were taught and one similar transfer word differing only in initial consonant was used as a test to

see if the concept learned using the word families could be transferred to a new word. At the conclusion of each session, the three taught words and one transfer word were reviewed. A fifth session was conducted for thirty minutes per subject and was used for assessment. The twelve taught words and four transfer words were used to ascertain how many of the total group of words each subject could recognize by identification using the Carba system. The order of presentation of the words was randomly determined using a random numbers table for each teaching part of a session, review part of a session, and the final assessment session.

Each session of the Carba presentation of word family patterns began with the introduction of three consonant letters. Each capital letter was printed with a felt tip marker on a card measuring 1" x 1" and placed on the synoptic display board letter grid in reverse alphabetical order by choice of the investigator. The letters occupied row one, columns two, four, and six, Diagram 1. Each subject identified the requested letter of the alphabet by actuating the Carba equipment with his/her assigned pick-up. The subject was requested to "Show me the letter _____", at which time the synoptic display board was actuated by the subject with the use of the assigned pick-up. The light on the synoptic display board proceeded from the "X", or starting position, at the bottom left corner of the board across the numbered grids in a horizontal direction once actuated, Diagram 2. The subject then momentarily stopped the light on the grid square directly below the letter to be identified, Diagram 3. Subsequently, the light proceeded in an upward or vertical pattern until the subject once again actuated the Carba pick-up device, but this time stopping it directly on the letter to be identified, Diagram 4. The light on the synoptic

display board then immediately and automatically returned to the starting position, or position "X", after letter identification.

As soon as it was determined that the subject could identify each requested letter, the investigator orally presented three examples of words from either the subject's sight vocabulary and/or listening vocabulary containing the identified consonant in the initial position. This procedure was followed so that each subject could hear how each letter sounded in the context of a word already known by the subject.

The word family pattern to be taught was introduced next. Letters of the word family pattern, for example, -at, were printed in capital letters on a card measuring 1" x 1" to accommodate the grid squares on the synoptic display board. The card having the word pattern was secured to the synoptic display board with masking tape on the reverse side in row seven, column three during each session. The family pattern was pronounced for the subject. Each consonant letter, introduced above, was then presented in combination with the family pattern resulting in the words on Training List I, Chart 4. A fourth consonant letter belonging to the transfer word was next introduced. It was presented in row one, column eight during each session. The transfer consonant was not presented in combination with the family pattern being taught, however. Once the three words had been taught, they were reviewed. Each word was located directly above its initial consonant in row three, columns two, four, and six during each session, Diagram 5. The word to be used in transfer was located in column eight, row three, Diagram 5. The subject was requested to identify each word including the transfer word that had not been taught, three times by properly actuating the Carba synoptic display board. A total of twelve responses was recorded for each word family.

The length of time required by each subject to give a response was determined with an electronic timing mechanism with which the Carba system was equipped. The following data were recorded: whether an attempt was made to respond; amount of time it took to elicit a response; and, whether response was deemed correct, incorrect, or indeterminate by the paraprofessional and investigator who served as observers. A response was considered correct if the subject actuated Carba in such a manner that the synoptic display board's light was positioned to directly correspond with the letter or word to be identified and immediately returned to "X" or starting position. A response was considered to be incorrect if the subject actuated Carba in such a manner that the synoptic display board's light was positioned to directly correspond with a letter or word not requested for identification. A response was deemed indeterminate if the subject Carba in such a manner that the synoptic display board's light was positioned in a grid square unoccupied by either a letter or word.

There was no word family overlap between the sight words and the training/transfer words used in the study. The word family patterns selected had not been previously taught to the subjects. The orders of word families in the training and transfer lists were counterbalanced, also. During treatment B₁, the first session training words introduced had a vowel-consonant pattern. The transfer word was corresponded. During the second session, the training words used had the same vowel-consonant pattern as introduced during the first session, but the final vowel, e, was added making the first vowel long sounding. The transfer word used corresponded. Session three followed the same format as session one; session four was organized like session two.

Treatment B₂ Yes/No Response

Each subject was instructed in a one-to-one situation using Training List II and Transfer List II. All instruction was conducted in the regular classroom of the subject while other normal classroom activities were taking place. The investigator conducted the training sessions and was assisted by a paraprofessional. The paraprofessional and investigator served as observers. Seating arrangements were the same as those described under Baseline Assessment above. Directly in front of the subject and in view of the observers was a raised wooden card holder to display materials used during the investigation.

As far as possible, Treatment B₂ procedures were like those described in Treatment B₁ above. The exception was that here, Carba was not used. Instead of the subjects responding using the Carba equipment, his/her yes or no response had to be given and ascertained by the investigator and/or paraprofessional as being correct, incorrect, or indeterminate.

Results

During treatment B₁, the use of Carba-linguaduc equipment in teaching new words, a total of sixteen words were introduced to each subject. Sixteen words were also introduced to the subjects during treatment B₂, the use of subjects' gestural yes/no responses in teaching new words. Results with treatment B₁ indicated that all subjects made either a correct or incorrect response to the all words (16) presented. Using the Carba-linguaduc equipment, the four subjects studies made a definitive response 100 percent of the time to all words presented during the final assessment period. In comparison with treatment B₂, Subject C made a

definite correct or incorrect response to eleven of the sixteen words introduced, or 69 percent of the words presented. Subjects A and B responded correctly or incorrectly to seven words, or approximately 44 percent of the words introduced. Subject D made a correct or incorrect response to four of the words presented, or 25 percent of those introduced.

Summary of Results

A total of 64 words were presented to all subjects for each treatment. As a group, the subjects selected for this research study mastered 57 of the 64 words presented, or, approximately 89 percent mastery was achieved using treatment B₁, the use of Carba-linguaduc equipment in teaching new words. Of the 48 training list words presented to the four subjects during the first treatment, 43 words, or, approximately 89 percent mastery was achieved using treatment B₁. Sixteen transfer list words were presented to the subject during the first treatment, 43 words, or, approximately 89 percent mastery was achieved using treatment B₁. Sixteen transfer list words were presented to the subjects during treatment B₁. Fourteen of these words, or, approximately 87 percent mastery was achieved. In comparison, the subjects studied mastered 26 of the 64 words presented, or, about 40 percent mastery was achieved using treatment B₂, the use of gestural yes/no responses in teaching new words. Forty-eight training lists words were presented to the four subjects during treatment B₂. The subjects correctly identified 17 of the training list words, or, approximately 35 percent mastery was achieved. Of the sixteen transfer list words presented during the second treatment, the subjects correctly identified nine words, or

approximately 56 percent mastery was achieved.

The mean number of words mastered by the subjects using treatment B_1 , the use of Carba-linguaduc equipment in teaching new words, was 14.25. The mean number of words mastered by the subjects using treatment B_2 , the use of subjects' gestural yes/no response in teaching new words was 6.50.

The difference between the mean correct responses using Carba-linguaduc equipment and the mean correct responses using gestural yes/no responses was determined to be effective if the difference was greater than the mean correct responses using the subjects' gestural yes/no responses. The difference between the means of 14.25 and 6.50 was $D = 7.75$, and this difference was greater than the mean correct responses using the subjects' gestural yes/no responses, treatment B_2 .

A treatment was determined to be reliable if the sum of the percentages of correct responses and incorrect responses was greater than the sum of the percentages of indeterminate and no responses. Using treatment B_1 , the use of Carba-linguaduc equipment in teaching new words, the sum of the percentages of indeterminate and no responses for all subjects was zero. Using treatment B_2 , the use of subjects' gestural yes/no responses in teaching new words, the sum of the percentages of indeterminate and no responses for all subjects was 218 percent, or, the mean percent for the group of subjects was approximately 55 percent. Also, utilizing treatment B_1 , the sum of the percentages of correct and incorrect responses was 400 percent, or, the mean percent for the group of subjects was 100 percent. Using treatment B_2 , the use of the percentages of correct and incorrect responses was 180 percent,

or, the mean percent for the group of subject was 45 percent. For the group of subjects, the sum of the percentages of correct and incorrect responses was greater than the sum of the percentages of indeterminate and no responses only with the use of Carba-linguaduc equipment in teaching and assessing new words, treatment B₁.

Conclusions

The conclusions which are to be presented in this section will be discussed according to the results reported.

A primary purpose of the study was to determine if the Carba-linguaduc equipment was an effective means to teach and assess word recognition abilities with the severely physically handicapped, non-verbal, cerebral palsied young adult. The Carba equipment was determined to be effective if the difference between the mean correct responses using Carba was greater than the mean correct responses using the subjects' gestural yes/no responses. The results of the study indicated that the Carba-linguaduc equipment provided a more effective way for the severely physically handicapped, nonverbal, cerebral palsied young adult to respond during the teaching and assessment of new words than was the use of gestural yes/no responses.

A treatment was determined to be reliable if the sum of the percentages of correct responses and incorrect responses was greater than the percentages of indeterminate and no responses. The sum of the percentages of correct and incorrect responses was greater than the sum of the percentages of indeterminate and no responses only with the use of Carba-linguaduc equipment in teaching and assessing new words, treatment B₁. Due to the nature of these results, it was concluded that

the Carba-linguaduc equipment was reliable for the population studied, and the use of gestural yes/no responses was not.

The research focused on whether significant language learning as measured by number and percentage of new word families recognized can take place in the severely physically handicapped, nonverbal, cerebral palsied young adult. Results indicated that, utilizing the Carba-linguaduc equipment, the subjects recognized about 89 percent of the word families introduced. Using their gestural yes/no responses, the subjects investigated recognized approximately 41 percent of the word families introduced.

When the total number of words recognized by the subjects were combined, it was found that the subjects identified approximately 65 percent of the word families introduced. About 62 percent of all words recognized were training list words; approximately 71 percent of all words recognized by the subjects were transfer list words. It was concluded that significant language learning as measured by number and percentage of new word families recognized can take place in the population studied.

Chart 1

SIGHT WORD LISTS I

Subject			
A	B	C	D
bus	bird	birthday	big
chair	black	bus	Carla
clothes	dog	dad	did
football	he	doctor	do
happy	look	mom	doctor
mom	page	nurse	house
potty	pool	sad	mom
school	red	school	put
shoes	the	sick	school
spaghetti	tree	teacher	the

The words in Chart 1 were used to assess baseline conditions with the subjects preceding treatment B₁.

Chart 2

SIGHT WORD LISTS II

Subject			
A	B	C	D
bath	are	are	and
breakfast	and	come	away
car	be	down	bus
Delrey	door	funny	dad
dentist	feet	go	down
Joe	here	run	Girl Scouts
milkshake	is	summer	go
morning	monkey	the	little
sick	Patch	person	out
tomorrow	ride	up	Tuesday

The words in Chart 2 were used to assess baseline conditions with the subjects following treatment B₁.

Chart 3

SIGHT WORD LISTS III

Subject			
A	B	C	D
bed	Ann	and	an
doctor	blue	cold	be
Gino's	car	cook	book
home	doctor	dog	for
me	down	help	I
so	have	hot	in
today	me	in	love
T.V.	mom	out	morning
week-end	read	spring	to
yesterday	yellow	under	up

The words in Chart 3 were used to assess baseline conditions with the subjects following treatment B₂.

Chart 4

TRAINING LIST I AND TRANSFER LIST I

No. Training Word	Transfer Word
I	mat
pat	
tat	
bat	
II	mate
pate	
tate	
bate	
III	pit
lit	
sit	
mit	
IV	pite
site	
mite	
lite	

The words in Chart 4 were used during treatment B₁.

Chart 5

TRAINING LIST II AND TRANSFER LIST II

No. Training Word	Transfer Word
I	pop
bop sop mop	
II	pope
bope sope mope	
III	bot
lot pot mot	
IV	bote
lote pote mote	

The words in Chart 5 were used during treatment B₂.

Chart 6

PHYSICAL CONTROL EVALUATION: FOR SELECTION OF OUTPUT DEVICES

NAME: _____ DATE: _____
 CENTER: _____ DOB: _____
 EVALUATOR: _____ AGE: _____

TEST SITE (classroom, home, van, etc.): _____

POSITION OF INDIVIDUAL

Seated:

position _____
adaptations to chair _____
bracing _____
other _____

Reclining:

position _____
type of bed (or chair) _____
adaptations _____
bracing _____
other _____

EVALUATION OF MOVEMENTS

EVALUATION OF MOVEMENTS		control	p.i.t.	difficult	no voluntary control	involuntary movement	comments
HEAD	midline (maintain 30 sec.)						
	left						
	right						
	forward						
	backward						
SHOULDER							
	right						
	left						
RIGHT ARM							
	forward						
	right						
	left						
	retract						
	midline						
	raise						
	lower						

	control	p.i.t.	difficult	no voluntary movement	involuntary control	comments
index						
flex						
lift						
lateralize						
isolate						
other fingers						
LEFT HAND						
grasp						
release						
RIGHT LEG						
hip						
rotate						
stretch						
knee						
flex						
stretch						
abduction						
adduction						
foot						
lift						
pronate						
supinate						
use toes						
LEFT LEG						
knee						
flex						
stretch						
abduction						
adduction						
hip						
rotate						
stretch						
foot						
lift						
pronate						
supinate						
use toes						
EYES						
up						
down						
lateral						
blink						
close						
open						

	control	p.i.t.	difficult	no voluntary control	involuntary movement	comments
RIGHT ELBOW						
flex						
straighten						
RIGHT WRIST						
flex						
supinate						
rotary (wrist and forearm)						
RIGHT FINGERS						
thumb						
flex						
lift						
lateralize						
lower						
index						
flex						
lift						
lateralize						
isolate						
other fingers						
RIGHT HAND						
grasp						
release						
LEFT ARM						
forward						
right						
left						
retract						
midline						
raise						
lower						
LEFT ELBOW						
flex						
straighten						
LEFT WRIST						
flex						
supinate						
rotary (wrist and forearm)						
LEFT FINGERS						
thumb						
flex						
lift						
lateralize						
lower						

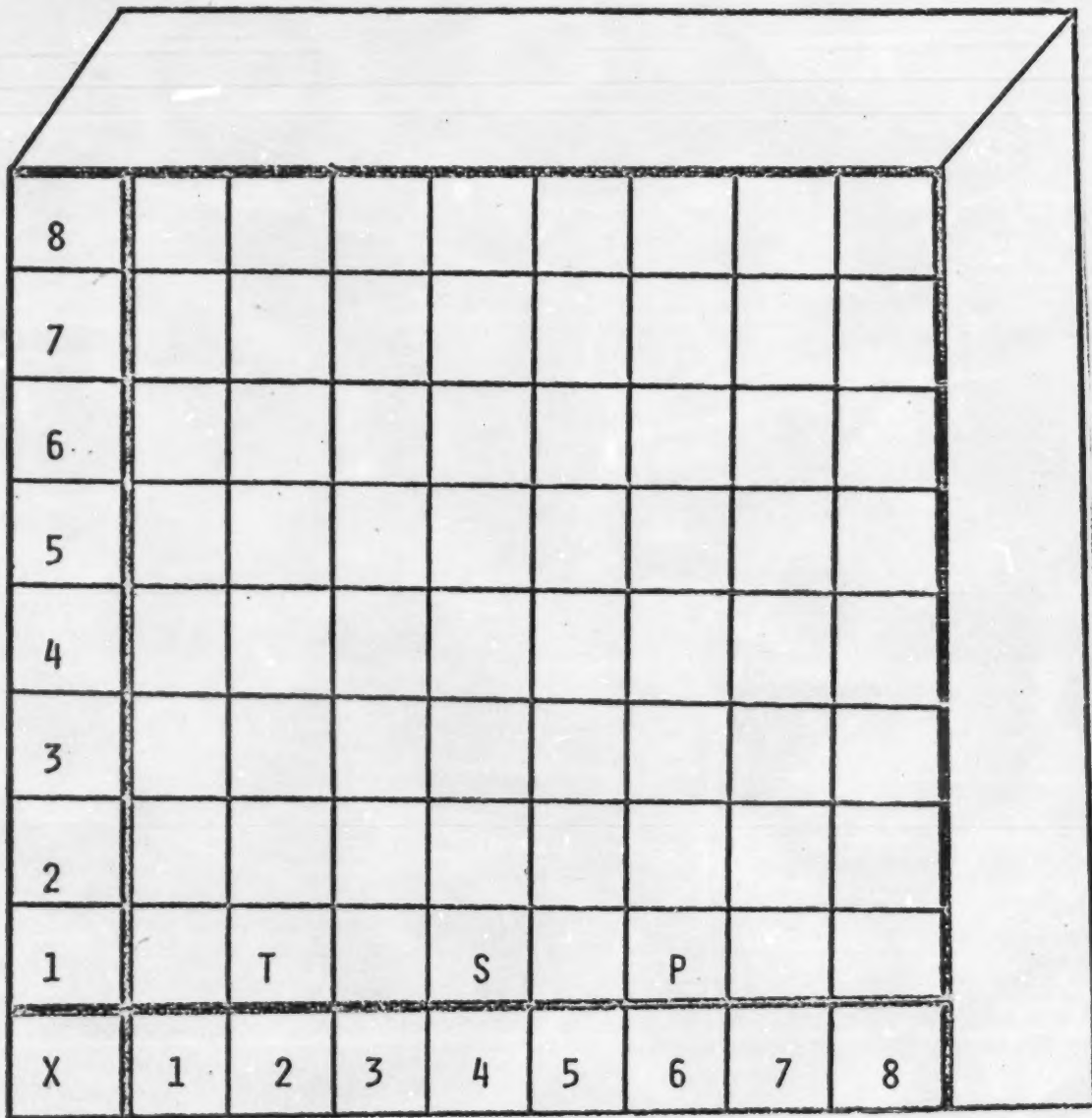
	control	p.i.t.	difficult	no voluntary control	involuntary movement	comments
MOUTH						
tongue _____						
suck _____						
sip _____						
ADDITIONAL INFORMATION						
PRESENTLY USES (describe)						
typewriter _____						
pencil/pen _____						
language board _____						
gestures _____						
eyes _____						
verbal _____						
utterances _____						

p.i.t. (possible if trained)

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Diagram 1

PLACEMENT OF LETTERS ON SYNOPTIC DISPLAY BOARD

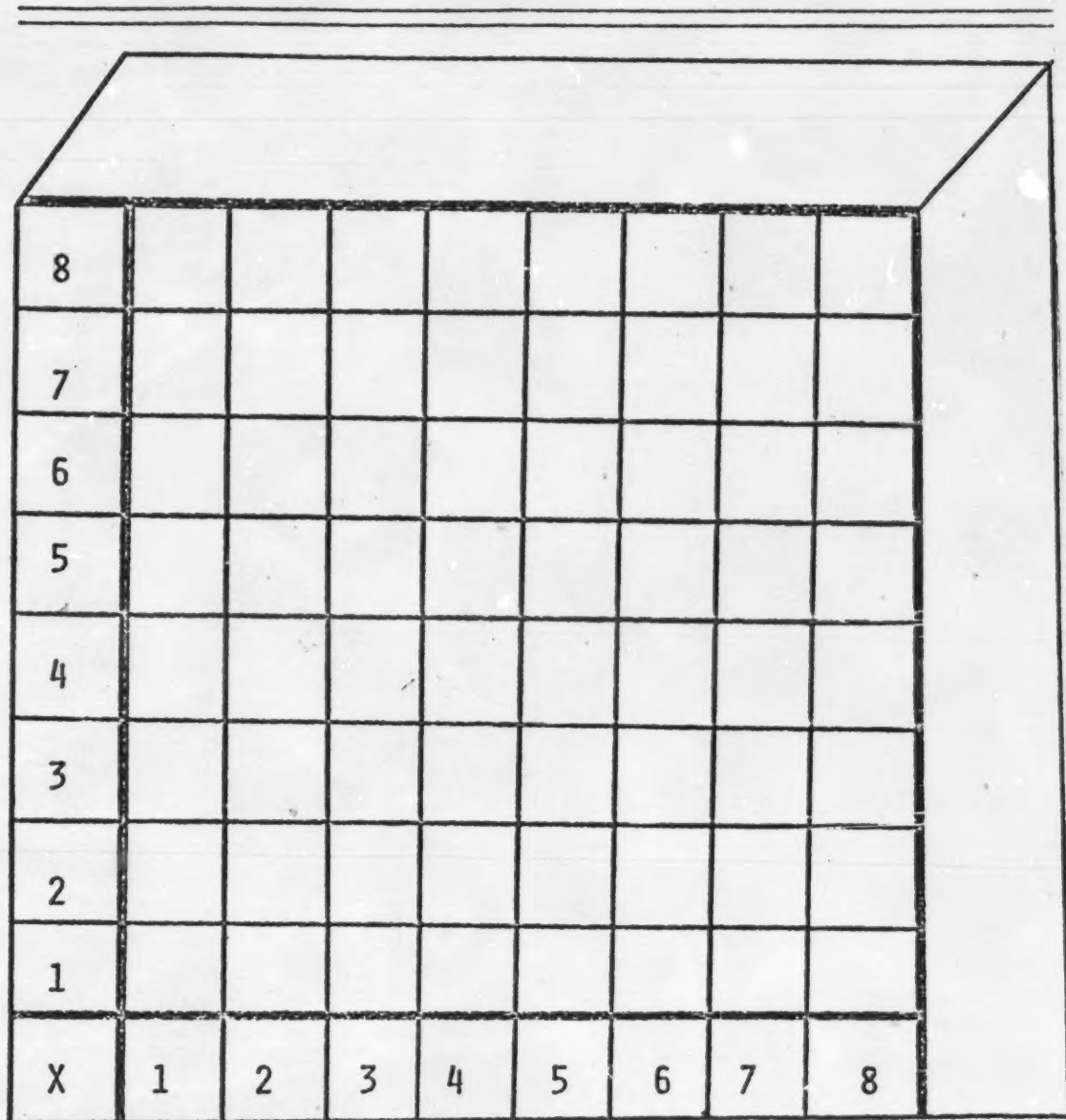


8								
7								
6								
5								
4								
3								
2								
1		T		S		P		
X	1	2	3	4	5	6	7	8

Diagram 1 shows the placement of the first three letters on the synoptic display board which were introduced to subjects at the beginning of treatment B₁.

Diagram 2

STARTING POSITION ON SYNOPTIC DISPLAY BOARD



↑ Starting position of light on synoptic display board.

Diagram 3

INITIAL IDENTIFICATION OF LETTER ON SYNOPTIC DISPLAY BOARD

8								
7								
6								
5								
4								
3								
2								
1		T		S		P		
X	1	2	3	4	5	6	7	8

Diagram 3 shows that the shaded block number 4 in the bottom row indicates that subject has made initial horizontal stop on synoptic display board in attempt to ultimately identify the letter "S".

Diagram 4

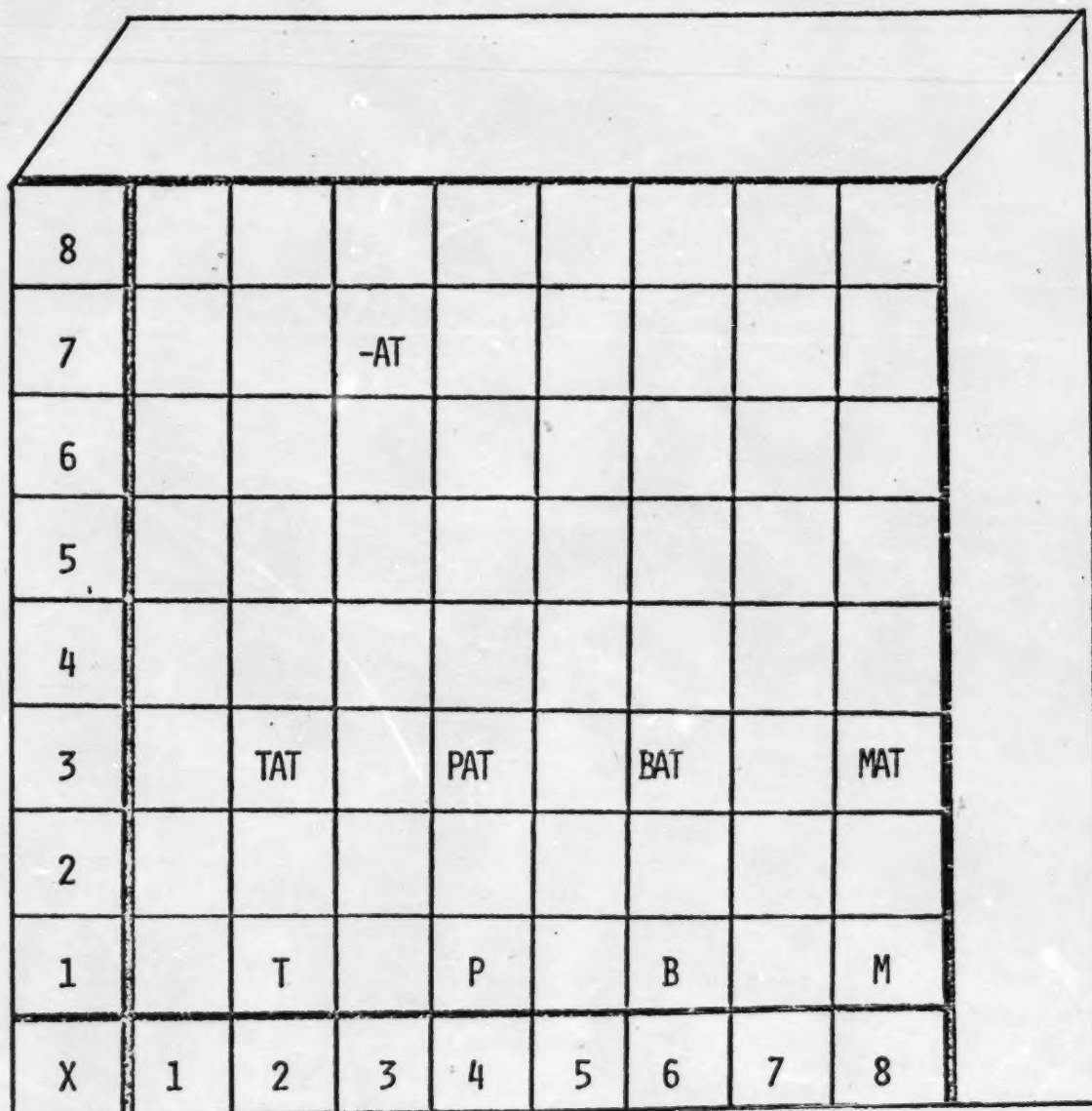
FINAL IDENTIFICATION OF LETTER ON SYNOPTIC DISPLAY BOARD

8								
7								
6								
5								
4								
3								
2								
1		T		S		P		
X	1	2	3	4	5	6	7	8

Diagram 4 shows that the shaded area in row one, column four indicates that the subject has made final vertical stop on the synoptic display board in the attempt to identify the letter "S".

Diagram 5

PLACEMENT OF WORDS ON SYNOPTIC DISPLAY BOARD



8								
7			-AT					
6								
5								
4								
3		TAT		PAT		BAT		MAT
2								
1		T		P		B		M
X	1	2	3	4	5	6	7	8

Diagram 5 gives an example of the placement of words and letters on the synoptic display board used by subjects during treatment B₁.